Nuclear Safety Workshop

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Working Together to Enhance Nuclear Safety

Development of Guidance for Analysis of Beyond Design Basis Events

Dr. James O'Brien
Office of Nuclear Safety
Office of Health, Safety and Security
U.S. Department of Energy

U.S. DEPARTMENT OF ENERGY

Background

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- Types of DOE Facilities
  - Research Reactors;
  - Weapons disassembly, maintenance, and testing facilities;
  - Nuclear material storage facilities;
  - Processing facilities; and waste disposal facilities.

- Safety Analysis Framework
  - DOE Nuclear Safety Policy
  - Nuclear Safety Rule
  - Nuclear Safety Analysis Standards
  - Documented Safety Analysis Guide

Background (continued)

- Nuclear Safety Rule Requires
  - *Consideration of the need for analysis of accidents which may be beyond the design basis of the facility.*

- Amplifying Guidance in Documented Safety Analysis Standard
  - *Consider the need for analysis of accidents that may be beyond the design basis of the facility in order to provide a complete perspective on the risk associated with operating the facility.*

Steps to Look for Improvements to Guidance

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- Internal review of DOE requirements and guidance for safety analysis, facility design, and emergency response;
- Review of response to DOE Safety Bulletin 2011-1;
- Monitoring of regulatory actions in the commercial and international nuclear power industry;
- Nuclear Safety Workshop in 2011;
- Recommendations in DOE Report to Secretary in August 2011, *Review of Requirements and Capabilities for Analyzing and Responding to Beyond Design Basis Events*;
- Results of Pilot Evaluation Studies conducted at several DOE facilities during 2012.

Insights

- DOE safety analysis processes require evaluation of all credible internal events using a bounding analysis.
  - Exception: External Events and Natural Phenomena Events have a specified frequency or performance goal that are utilized to define the size of event.

- The results of these analysis show that the large majority of DOE nuclear facilities do not have the potential for a significant impact to the public.

Insights (continued)

- Documented Safety Analyses (DSAs) at existing DOE Hazard Category 2 facilities have some level of Beyond Design Basis Event (BDBE) analysis.

- DSAs could be improved with expanded discussion of BDBEs that considers a spectrum of Natural Phenomena Hazards (NPH) events and additional details regarding accident management strategies.

- In most cases, BDBE analysis can be accomplished using simplified qualitative techniques and assumptions and drawing on conclusions reached in Design Basis Analysis.

Insights (continued)

- Relationship to Nuclear Regulatory Commission Driven Efforts for Nuclear Power Plants
  - Multi-step Effort ("immediate," near-term, longer-term)
  - Focus on NPH
  - Includes walkdowns
  - Includes look at regulatory framework

- Relationship to other BDBE efforts
  - Nexus to European Community "stress tests"
  - Use of Industry tools for walk downs and seismic evaluations

Evaluation of Existing Facilities

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- Walkdown to Look for Vulnerabilities
  - Focused on NPH
- Critical Safety Function (CSF) Identification
- Qualitative Evaluation of Potential Impacts of BDBEs on One or More CSFs
  - Cliff Edge Effect
- Look at Margins to Failure of Equipment Important to CSFs when Subject to BDBEs
  - Involves walkdown and review of design documents
- Look for Potential Design, Operations, or Emergency Response Improvements

Evaluation of Existing Facilities (continued)

- Evaluation Team
  - Multi-discipline
  - Safety Analysis
  - NPH Expert
  - Operations
  - Emergency Management
- Documentation of Results
- Maintenance of Enhancements

Potential Operating Experience Report

- Discuss Lessons Learned from Pilots.
- Provide Guidance for Performance of Reviews.

Guidance for New Facilities

- Amplify Guidance on evaluation of BDBEs to look for potential design/operation/emergency response enhancements.
- Focus on determination of whether there is a cliff edge effect.
- Provide guidance on how to document analysis and maintenance of any identified enhancements.